

Charged Hadron/Pion Trigger

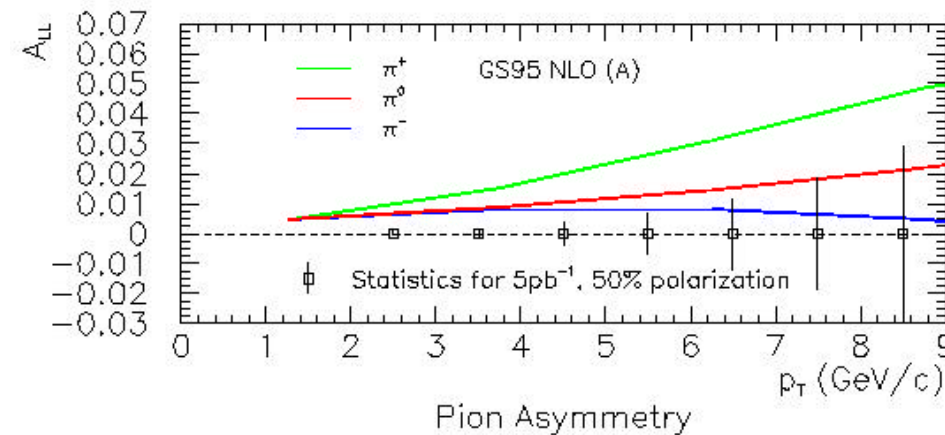
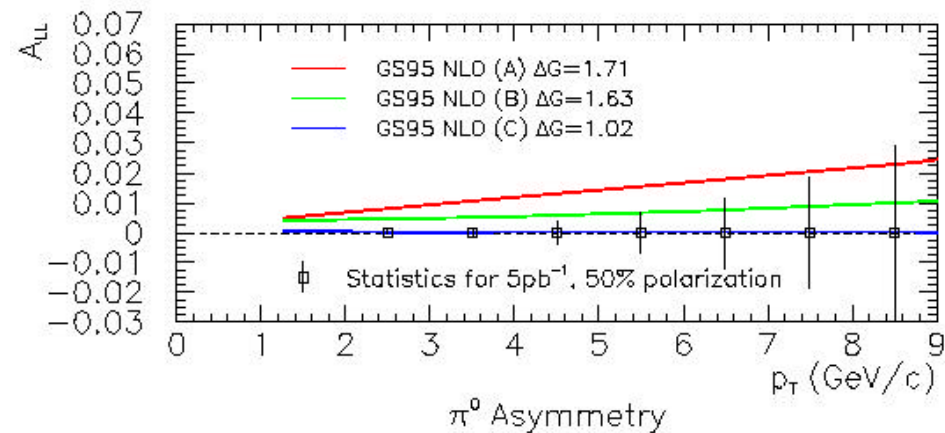
EMCal/RICH Trigger Meeting

June 29, 2001

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Spin physics with pions/hadrons

- π^0/π^\pm /charged-hadrons
 - gluon polarization information in 1st year of pol-p collisions
 - different asymmetry for neutral/charged pions/hadrons by quark-flavor decomposition
- π^\pm /charged-hadrons
 - $2\text{GeV}/c < p_T < 5\text{GeV}/c$: no PID
 - $p_T > 5\text{GeV}/c$: π -ID by RICH/EMCal
 - ➔ $dA_{LL} < 0.5\%$ in each bin required
 - ➔ 2×10^5 entries in each bin necessary for 50% polarization
- trigger rate
 - 250kHz in 10% luminosity
 - down to 5kHz (?) by 1st-level trigger
 - down to 800Hz by 2nd-level trigger



no trigger consideration,
statistical errors only

Current Status

- Hardware
 - EMCAL FEE test – ORNL & Hisayuki, et al. @ 1008
 - logic check
 - uniformity of noise level
 - EMCAL/RICH LL1 – UCR group et al.
- 1st level trigger simulation
 - Quick MC with PYTHIA
 - PISA simulation
 - PYTHIA minimum bias events exist – for rejection study
 - generating PYTHIA QCD-jet events with charged hadron selection
 - for efficiency study
- Newcomer
 - Kensuke Okada, RIKEN

Current Status

- Physics requirements
 - spin physics
 - $p_T > 2\text{GeV}/c$, 2×10^5 entries in each bin
 - rejection rate $\sim 10^3$ required
 - comparison data for heavy-ion physics
 - momentum ? entry ?
- 1st level trigger simulation
 - quick MC with PYTHIA
 - EMCal response from beam test data
 - combination of
 - minimum bias trigger \otimes prescale
 - hadron $p_T < 2\text{GeV}/c$
 - EMCal trigger high threshold
 - π^0 $p_T > 2\text{GeV}/c$ with EMCal 4×4 tile (noise level $\sim 2\text{GeV}$)
 - EMCal/RICH trigger
 - π^\pm $p_T > 5\text{GeV}/c$ with EMCal 2×2 tile (noise level $< 50\text{MeV}$?)
 - EMCal multiplicity trigger (\otimes prescale, if necessary)
 - h^\pm $2\text{GeV}/c < p_T < 5\text{GeV}/c$?? with EMCal 2×2 tile

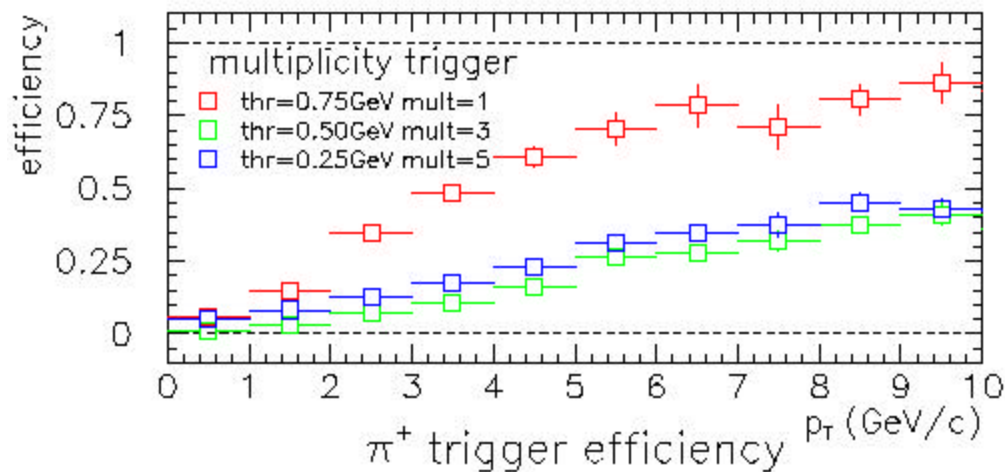
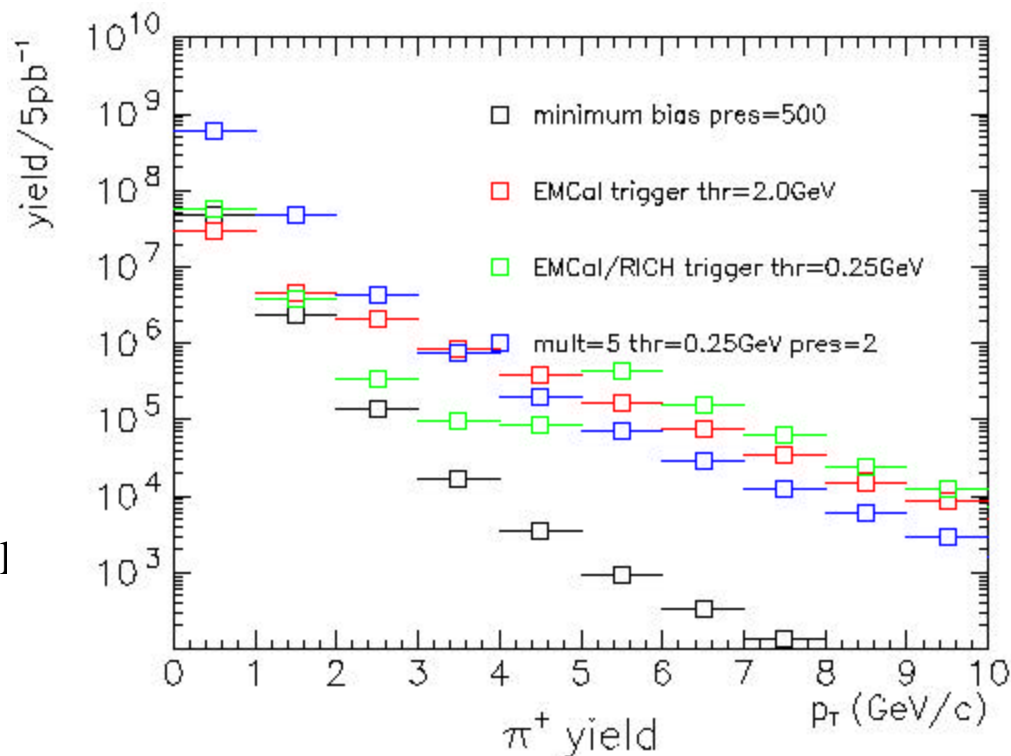
Current Status

- 1st level trigger simulation
 - Quick MC with PYTHIA
 - multiplicity trigger or EMCal trigger necessary
 - optimum multiplicity & EMCal threshold energy
 - threshold < 700MeV required from charm/electron triggering

multiplicity	1	3	5
threshold (MeV)	750	500	250
rejection factor	68	955	258

rejection ~100 in PISA study by Matthias et al.

→ PISA study necessary



To-Do List

- 1st level trigger
 - PISA simulation
 - PYTHIA QCD-jet events with charged hadron selection will be made by Basanta
 - 1st level trigger classes by Wei et al. will be used by Kensuke
 - to study
 - rejection rate
 - hadron/pion trigger efficiency
 - bias study – z, p_T of jet
 - how to extract trigger efficiency from data ?
 - bandwidth sharing
 - 3.5-5kHz (?) in total
 - photon/electron/charged-hadron/pion/muon
 - minimum bias for trigger study and H.I. physics comparison data
- 2nd level trigger
 - tools
 - 2nd level trigger package for H.I. run will be used
 - PC/DC/TEC